

Appl. No.: 10/808,692
Amdt.dated 12/07/2006
Reply to Office action of 09/08/2006

REMARKS/ARGUMENTS

Claims 1 – 4 and 15 have been rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,632,489 to Watanabe. Claim 5 has been rejected under 35 U.S.C. § 103(a) as being obvious over the combination of Watanabe and U.S. Patent Publication No. 2004/0155053 to Nishiyama. Claims 13 and 14 have been rejected under 35 U.S.C. § 103(a) as being obvious over the combination of Watanabe and U.S. Patent No. 6,576,568 to Mandal.

Before reviewing the prior art rejections, it is noted that the previous rejections based on the same cited references were withdrawn as a result of a pre-appeal conference. It is surprising that these same references that were insufficient to maintain a prima facie case of obviousness have now been cited independently or recombined in the present rejections. Nevertheless, the claimed invention is patentable over the cited references and the references are not properly combinable for the same reasons set forth in Applicants pre-appeal brief that was filed on July 20, 2006.

The Office Action alleges that the Watanabe teaches a composition for forming a porous film comprising a condensation product and an organic solvent, wherein the condensation product is obtained by condensation in the presence of an acid. This is a technically inaccurate statement and is not supported by the process described in Watanabe. The Office Action alleges the condensation is performed in the presence of an acid, but has failed to show where this alleged teaching can be found in Watanabe.

Watanabe describes a four step process (steps a- d) in which a dehydration-condensation reaction is performed in the presence of a neutral to basic solution. Steps a and b describes a process of making a silicate solution that is to be used in a subsequent condensation step. An acidic silicate is used in making the solution. In step c, the solution prepared in step b is mixed with an alkali metal hydroxide, water-soluble organic base or water-soluble silicate such that the pH becomes 7 to 11. See column 4 lines 60 -64 and column 9, lines 7 – 18. In step d, the now neutral to basic solution prepared in step c is heated to effect dehydration-condensation of the silicates. Watanabe states the following:

In the step (d), the mixed liquid (c) obtained by the above-mentioned step (c) is heated. This heating is effected at 100 to 200° C and the heating time is required to be from about 0.5 to 50 hours. The heating is preferably conducted with

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stirring the above-mentioned liquid and possibly under the conditions where the evaporation of water is not generated. [...] By this heating, the spherical colloidal silica particles (particle diameter D₂) and the silica bonding the spherical colloidal silica particles to each other bond through dehydration-condensation reaction and the silica particles link in rows in one plane only to generate moniliform colloidal silica particles....

See column 9, lines 19 – 36. (Emphasis added)

The addition of a base in step c, results in the solution obtained in step b having a pH of 7 to 11. A solution having pH of 7 to 11 is not considered to be acidic. In fact, Watanabe specifically teaches changing the pH of the solution from acidic to neutral or basic prior to step d in which the dehydration-condensation reaction is performed. Thus, Watanabe does not disclose or suggest performing a dehydration-condensation reaction in the presence of an acid. Accordingly, Claims 1 – 4 and 15 are not anticipated by Watanabe and it is respectfully requested that this rejection be withdrawn. Since Watanabe fails to disclose each and every element recited in independent Claims 1 and 15, Claims 1 and 15 and any claims dependent thereon are patentable over the cited references, whether considered individually or in combination.

Claim 5 has been rejected over the combination of Watanabe and Nishiyama. However, as discussed above, Watanabe fails to disclose or suggest the step of suggesting performing a dehydration-condensation reaction in the presence of an acid. Moreover, as pointed out by the Applicants and confirmed by the Panel's decision in the pre-appeal conference, these references are not properly combinable. Thus, Claim 5 is also patentable over the combination of Watanabe and Nishiyama, and it is respectfully requested that this rejection be withdrawn.

In the previous Office Action, Claims 13 and 14 were rejected as being unpatentable over the combination of Nishiyama, Watanabe, and Mandal. This rejection was withdrawn as a result of the pre-appeal conference. Claims 13 and 14 have now been rejected over the combination of Watanabe and Mandal.

As previously pointed out, Mandal describes a sol-gel having a specific precursor solution that can be used to form a film having a dielectric constant less than 2.3. Specifically, Mandal describes a precursor solution having a purified nonionic surfactant and an additive that

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is either an ionic additive or an amine additive. The sol-gel described in Mandal is completely different than that recited in the present claims or described in Watanabe.

The Examiner alleges that Mandal teaches a sol-gel that can be used to prepare a film having a dielectric constant of less than 2.3 and a modulus of elasticity between 5 and 50 GPa, and it would therefore be obvious to customize the compositions of Watanabe to have the recited properties. In essence, the Examiner is asserting that since Mandal teaches a sol-gel that can be used to prepare a film having a certain dielectric constant and modulus of elasticity, a film can be prepared from the silica compositions of Watanabe to have the claimed properties. The Examiner's reasoning is flawed for several reasons.

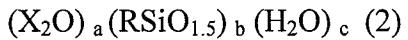
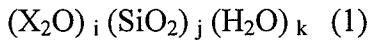
First, there is no disclosure or suggestion in Watanabe to produce a film having such properties or that such a film could even be produced from the described sol-gels. In fact, Watanabe is directed to a sol that is used in ink jet printing, which is completely different than the objective and purpose of Mandal. It is clear that the references are directed to two totally unrelated objectives and do not contain the necessary nexus to motivate a combination of teachings. The objectives and aims of the references are unrelated to one another. Further, there is no teaching in Watanabe that would lead one to believe that the disclosed compositions could be modified to produce a film having the recited properties, let alone how such a modification would be performed. The only source for such a teaching can come from Applicants' own teaching, which is impermissible. It is abundantly clear that the Examiner is merely selecting properties from Mandal to make the rejection.

Second, in order to maintain an obviousness rejection, there must be some reasonable expectation of success. However, as noted above, the compositions described in Watanabe are completely different than that of Mandal. There is nothing in the references that would suggest the compositions could be modified successfully to have the claimed properties. In contrast to an expectation of success, one would actually anticipate failure. Mandal repeatedly emphasizes that in order to obtain a film having the desired properties, the "surfactants are purified to remove impurities from the surfactant molecules, to reduce or eliminate the presence of alkali metal and alkali ion impurities, which are known to be detrimental to integrated circuit fabrication." See column 5, lines 5 - 9. Mandal further credits the improved properties of the film to the presence of specific purified ionic or amine additive. For example, Mandal states "[v]ery significantly, it

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was subsequently discovered that a purified surfactant could be used to produce porous films with desired low dielectric constants if specific types of ionic or amine additives were added to the formulation in relatively low concentration. See column 5, line 66 through column 6, line 3. Thus, it is clear from the teachings of Mandal that the claimed properties are present in the film because of the presence of specific additives that are purified to remove alkali impurities. In contrast, the compositions described in Watanabe teach the presence of alkalis such as K or Na in the compositions. For example, Watanabe specifically teaches adding alkali hydroxides, such as sodium and potassium, to change the pH of the solution. See Watanabe column 8, lines 61 - 62. Thus, based on the teachings of Mandal, one would expect that the compositions described in Watanabe could not be used to prepare films having the recited properties. Thus, the Examiner has failed to establish a *prima facie* case of obviousness, and Claims 13 and 14 are patentable over the cited references.

Further, Claim 1 specifically recites that the composition for forming the porous film includes at least one compound selected from the group consisting of silicate represented by formula (1) and organosilicate represented by formula (2)



wherein X independently represents Li, Na, K, Rb, Cs or quaternary ammonium.

The present specification further teaches that the composition of Claim 1 can be used to form a porous film having a dielectric constant that is less 2.3 and a modulus of elasticity of 5 to 50 GPa. Specifically, Example 2 describes a process for preparing a porous film in which potassium hydroxide was used. The resulting film had a dielectric constant of 2.1 and a modulus of elasticity of 4.5 GPa. In Example 4, the film was prepared using a sodium silicate as a precursor along with sodium methylsiliconate. The resulting film had a constant of 2.3 and a modulus of elasticity of 6.5 GPa. In view of the teachings of Mandal, these results are quite surprising and contrary to expectations.

Thus, Claims 13 and 14 are patentable over the cited references for any one of the following reasons: 1) the combination of Watanabe and Mandal fails to teach the claimed invention; 2) the teachings of Mandal are not properly combinable with Watanabe, and 3) even as combined the claimed invention provides unexpected results.

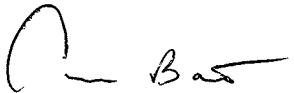
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In view of the foregoing remarks, it is respectfully submitted that the rejections under 35 U.S.C. § 102(e) and 103(a) have been overcome, and that the pending claims are in condition for immediate allowance.

Conclusion

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,



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